

Claims

1. Method for control of an electrophotographic printer [sic] or copier,  
5       in which information that refer to a single sheet (X) are determined from  
         the print data that are supplied to the printer or copier,  
  
10      a transport path of the single sheet through the printer or copier to generate  
         at least one print image on at least one side of the sheet (X) is determined  
         dependent on this information,  
  
15      at least one desired point in time at which or until which at least one sensor  
         signal is expected and/or at least one actuator is activated is established  
         dependent on the transport path, whereby the desired point in time refers to  
         a system time of the printer or copier.
2. Method according to claim 1, characterized in that the system time is  
predetermined by a timer (68, T3, T7, T8) with the help of a counter that  
counts a clock signal with a constant frequency.  
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3. Method according to any of the preceding claims, characterized in that the  
desired point in time determines the point in time at which an edge of the  
single sheet should arrive at the sensor (LS1 through LS13).
- 25    4. Method according to claim 3, characterized in that the sensor is a light  
barrier (LS1 through LS13) or a swing arm switch by which a sensor signal  
is output upon arrival of a sheet edge.
- 30    5. Method according to claim 1 or 2, characterized in that the sensor [sic] a  
feedback device of an actuator by which a sensor signal is output upon  
reaching a predetermined actuator position.

6. Method according to any of the preceding claims, characterized in that the desired point in time determines the point in time at which the actuator (V, SM) is activated by a control unit of the printer or copier.  
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7. Method according to claim 6, characterized in that the actuator is a step motor (SM1A, SM1B) or a valve (V1, V2, V3).
8. Method according to any of the preceding claims, characterized in that a plurality of sensors, a plurality of actuators and at least two control units are provided in the printer or copier, whereby a first part of the sensors and/or actuators are connected with a first controller and a second part of the sensors and/or actuators are connected with the second controller.  
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9. Method according to claim 8, characterized in that the control units have the same time normal.  
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10. Method according to claim 8 or 9, characterized in that a synchronization signal via which the intern time control units of the control units are synchronized is supplied to the control units.  
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11. Method according to any of the preceding claims, characterized in that a sensor calculation process is associated with the sensor and an actuator calculation process is associated with the actuator in the controller.  
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12. Method according to claim 11, characterized in that at least two sensors and at least two actuators are provided, whereby a sensor calculation process is associated in the controller with each sensor for monitoring and evaluation of the sensors and an actuator calculation process is associated in the controller with each actuator for activation of the actuators.  
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13. Method according to one of the claims 11 or 12, characterized in that a time control calculation process is provided in the controller via which the desired points in time is [sic] compared with a real point in time, and via which a signal is output upon reaching and/or exceeding the desired point in time.  
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14. Method according to claim 13, characterized in that at least 2 desired points in time (preferably up to 200 desired points in time) are compared with the real point in time upon implementation of the time control calculation process.  
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15. Method according to any of the claims 8 through 14, characterized in that the same program element is respectively invoked and executed as a separate calculation process for monitoring and/or for evaluation of at least two sensor signals, whereby the program elements are invoked and/or executed with different initial values and/or different parameters.  
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16. Method according to any of the claims 8 through 15, characterized in that the calculation processes are executed in parallel by the controller.  
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17. Method according to any of the claims 8 through 16, characterized in that the calculation processes are executed by the controller as tasks in a multitasking operating.
- 25 18. Method according to any of the preceding claims, characterized in that a timeslot is associated with each calculation process, whereby the calculation processes are executed by the controller in succession in the timeslots.

19. Method according to any of the claims 8 through 18, characterized in that an operating system of the controller controls the execution of the calculation processes.
- 5      20. Method according to any of the preceding claims, characterized in that a plurality of desired points in time are stored in a storage of a time controller and that the desired points in time are compared by the time controller with the real point in time, whereby a signal is output by the time controller upon reaching or exceeding at least one desired point in time.
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21. Method according to claim 20, characterized in that the signal is an interrupt signal.
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22. Method according to claim 20 or 21, characterized in that the desired points in time are sorted in the storage according to their temporal sequence, whereby only the temporally [sic] next desired points in time is [sic] compared with the real point in time.
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23. Device for control of an electrophotographic printer or copier,
- that determines information that refer to a single sheet from print data that are supplied to the printer or copier,
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- that determines from this information the transport path of the single sheet through the printer or copier for generation of at least one print image on at least one side of the single sheet,
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- and that, dependent on the transport path, establishes at least one desired point in time at which at least one sensor signal is to be expected and/or at least one actuator is to be activated, whereby the desired point in time refers to a time normal of the printer or copier.

24. Method for control of an electrophotographic pritter [sic] or copier,  
in which, in a first operating mode for double-sided printing of a first single  
sheet, a print image is generated on the front side of the first sheet with the  
aid of a first printing group, and a print image is generated on the back side  
of the first sheet with the aid of a second printing group, whereby the sheet  
is supplied to the first printing group (74) and to the second printing group  
(76) on a first transport path,  
10 in a second operating mode for one-sided printing of single sheets, a print  
image is generated on the front side of a second single sheet with the aid of  
the first printing group (74) and a print image is generated on the front side  
of a third single sheet with the aid of the second printing group (76),  
15 whereby the second sheet is supplied to the first printing group (74) on a  
second transport path and the third sheet is supplied to the second printing  
group (76) on a third transport path,  
and in which a switch is made from the first operating mode to the second  
operating mode when a specific number of successive sheets that are to be  
printed one-sided is reached or exceeded.  
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25. Method according to claim 24, characterized in that the sheets to be printed  
one-sided in the first operating mode are printed one-sided on their front  
side upon falling short of the preset number.  
26. Method according to one of the claims 24 or 25, characterized in that the  
present number is set to a value in the range between 5 and 50 sheets,  
preferably to a value in the range between 8 and 20 sheets.  
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27. Method according to one of the claims 24 or 26, characterized in that the first sheet is turned between first printing group (74) and second printing group (76).
- 5      28. Method according to one of the claims 24 or 27, characterized in that the print data of at least the preset number of sheets are stored in a storage of the pritter [sic] or copier.
- 10     29. Method according to one of the claims 24 or 28, characterized in that a preset first separation between successive sheets to be printed is generated in the first operating mode, and that a preset second separation between successive sheets to be printed is generated in the second operating mode.
- 15     30. Method according to claim 29, characterized in that, given a change from the first operating mode to the second operating mode, a preset third separation is generated between the last sheet printed in the first operating mode and the first sheet printed in the second operating mode, whereby the third separation is larger than the first and/or second separation.
- 20     31. Method according to claim 29 or 30, characterized in that, given a change from the second operating mode to the first operating mode, a present fourth separation is generated between the last sheet printed in the second operating mode and the first sheet printed in the first operating mode, whereby the fourth separation is larger than the first and/or second separation.
- 25     32. Method according to one of the claims 24 or 31, characterized in that, given a one-sided printing of sheets in the first operating mode, only one printing group (74) generates a print image on the front side of the sheet, and the other printing group (74, 76) generates no print image or generates a non-inked print image on the back side of the sheet.
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33. Method according to one of the claims 24 or 32, characterized in that, due to different transport paths, the first sheet is supplied to the printer or copier from an input tray before the second sheet, whereby the second sheet is output into an output tray of the printer or copier before the first sheet.
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34. Method according to one of the claims 24 or 33, characterized in that the first operating mode is a duplex operating mode in which the sheet is supplied to the first printing group and, after the generation of a print image on the front side of the sheet, is supplied to the second printing group for generation of a second print image on the back side, and that the second operating mode is a fast simplex operating mode with increased throughput of sheets, in which sheets are alternately supplied to both printing groups via a gate in the input section.
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35. Electrophotographic printer or copier,
- that, in a first operating mode for double-sided printing of a first single sheet, a print image is generated on the front side of the first sheet with the aid of a first printing group (74) and a print image is generated on the back side of the first sheet with the aid of a second printing group (76), whereby the sheet is supplied to the first printing group (74) and to the second printing group (76) on a first transport path,
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- in a second operating mode for one-sided printing of single sheets, a print image is generated on the front side of a second single sheet with the aid of the first printing group (74) and a print image is generated on the front side of a third single sheet with the aid of the second printing group (76), whereby the second sheet is supplied to the first printing group (74) on a second transport path and the third sheet is supplied to the second printing group (76) on a third transport path,
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and in which a switch is made (with the aid of a controller) from the first operating mode to the second operating mode only when a preset number of successive sheets are to be printed one-sided.

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36. Method for control of an electrophotographic pritter [sic] or copier,

in which single sheets are printed by at least one printing group, whereby the sheets are transported on at least one transport path through the printer  
10 or copier and are supplied to the printing group (74, 76),

the arrival time of a first single sheet at a sensor is determined as a first real point in time and compared with a first desired point in time, whereby the transport speed of the first sheet is increased, reduced or maintained on a  
15 part of the transport path dependent on the deviation of the first real point in time from the first desired point in time,

the arrival time of a second single sheet at the sensor is determined as a second real point in time and compared with a second desired point in time,  
20 whereby the point in time [sic] the transport speed of the second sheet is increased, reduced or maintained on a part of the transport path dependent on the deviation of the second real point in time from the second desired point in time.

- 25 37. Method for control of an electrophotographic pritter [sic] or copier,

in which single sheets are printed by at least one printing group (74, 76), whereby the sheets are transported on at least one transport path through the printer or copier and are supplied to the printing group (74, 76),

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the arrival time of a first single sheet at a sensor is determined as a first real point in time and compared with a first desired point in time, whereby the point in time for changing the transport speed of the first sheet from a first transport speed ( $3.5 \times v_0$ ) to a second transport speed ( $2.5 \times v_0$ ) is

5           determined dependent on the deviation of the first real point in time from the first desired point in time,

the arrival time of a second single sheet at a sensor is determined as a second real point in time and compared with a second desired point in time, whereby the point in time for changing the transport speed of the second sheet from a first transport speed ( $3.5 \times v_0$ ) to a second transport speed ( $2.5 \times v_0$ ) is determined dependent on the deviation of the second real point in time from the second desired point in time.

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- 15     38. Method according to claim 36 or 37, characterized in that information that refer to a single sheet are determined from print data supplied to the printer or copier.
- 20     39. Method according to claim 38, characterized in that, dependent on the paper format to be printed, control points in time are determined for at least one par [sic] of the actuators and/or desired points in time are determined for at least one part of the sensor signals.
- 25     40. Method according to claim 39, characterized in that the first desired point in time specifies the arrival of a sheet edge of the first sheet at a first sensor.
- 30     41. Method according to claim 40, characterized in that the leading sheet edge and/or trailing sheet edge is detected by the sensor and subsequently evaluated.

42. Method according to any of the claims 36 through 41, characterized in that  
a plurality of control units are provided in the printer or copier, whereby at  
least one first control unit determines the control points in time and/or the  
desired points in time and a [sic] at last one second control unit activates  
the actuators and/or sensors, and whereby the first control unit and the  
second control unit have a common system clock for temporal  
synchronization.
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43. Method according to any of the preceding claims 36 through 42,  
characterized in that the sheet separation between the trailing edge of the  
first sheet and the leading edge of the second sheet is established by the  
time difference between the first desired point in time and the second  
desired point in time.
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- 15 44. Method according to any of the preceding claims 36 through 43,  
characterized in that a first sensor (LS1) is arranged after a first feed tray  
(Tray\_A) and a second sensor (LS2) is arranged after a second feed tray  
(Tray\_B).
- 20 45. Method according to claim 44, characterized in that the arrival points in  
time of all sheets extracted from the first feed tray (Tray\_A) are  
respectively detected at the first sensor (LS1), and that the arrival points in  
time of all sheets extracted from the first feed tray (Tray\_B) are  
respectively detected at the first sensor (LS2).
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46. Method according to any of the preceding claims 36 through 45,  
characterized in that a third sensor (LS9) is provided to which is supplied  
all sheets supplied to the printing group, the correct sheet position can be  
checked [sic], whereby the sensor (LS9) determines the arrival time of each  
sheet as a third real point in time and is [sic] compared with a  
predetermined third desired point in time, and the change of the transport
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speed is adapted for subsequent sheets given a deviation of the arrival point in time from the desired point in time at the first and/or at the second sensor.

5      47. Method according to any of the preceding claims 36 through 46, characterized in that the method is implemented before a printing group and/or before the output of the sheets.

10     48. Device for control of an electrophotographic printer or copier, with a measurement device that determines as a first real point in time the arrival point in time at a sensor of a first single sheet transported by a transport device,

15     with at least one control unit that compares the first real point in time with a first desired point in time and controls the transport speed of the first sheet in a region after the sensor,

20     in which the control unit increases, reduces or maintains the transport speed of the first sheet dependent on the deviation of the first real point in time from the first desired point in time, at least one a part of the region,

25     the measurement device determines as a second real point in time the arrival point in time at the sensor of a second single sheet transported by the transport device,

30     the control unit compares the second real point in time with a second desired point in time and controls the transport speed of the second sheet in a region after the sensor.

49. Device according to claim 48, characterized in that the [sic] control unit increases, reduces or maintains the transport speed of the second sheet at least on a part of the region, dependent on the deviation of the second real point in time from the second desired point in time.

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50. Device according to claim 48, characterized in that, dependent on the deviation of the second real point in time from the second desired point in time, the control unit determines the point in time for changing the transport speed from a first transport speed to a second transport speed.

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